

REMARKS

In the foregoing amendments, claims 10 and 16 were canceled. Claims 1-9 and 11 were previously canceled. Accordingly, claims 12-15 are in the application for consideration by the examiner at this time.

Applicant desires to express thanks to Examiner Kastler for the courtesies extended the undersigned in a personal interview on May 6, 2004. During the interview, it was agreed that a convincing showing that Satoh¹ does not positively teach an integral structure for the disk and stem, while applicant's specification teaches the desirability of such a structure, would overcome the rejection of claims 12-15 over Satoh. It was further agreed that a proposed amendment to claims 10 and 16 to more clearly distinguish these claims from the applied prior art would also be considered.

Applicant respectfully requests that the foregoing amendments be entered under the provisions of 37 C.F.R. § 1.116(b) for the purposes of placing the application in condition for allowance or for the purposes of appeal. The foregoing amendments simply cancel claims, thereby reducing issues for appeal and under consideration for patentability. In addition, applicant respectfully submits that remaining claims 12-15 are in condition for allowance.

¹ Satoh *et al.*, entitled "Application of Plasma Sprayed Ceramic Coatings to the Base Materials of the Rotating Disk in the Centrifugal Atomization Process" in Thermal Spraying, Vol. 29, No. 2, pp 15-20 (1992) (hereinafter referred to as "Satoh").

Therefore, applicant respectfully requests that the foregoing amendments be entered under the provisions of 37 C.F.R. § 1.116(b) for the purposes of placing the application in condition for allowance or for the purposes of appeal.

Claim 10 was rejected under 35 U.S.C. § 102(b) as being anticipated by either Karol² or Thiemeier³. Claim 16 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Thiemeier in view of Hogg⁴. Since claims 10 and 16 were canceled above, these rejections are now moot.

Claims 12-14 were rejected under 35 U.S.C. § 102(b) as being anticipated by the article by Satoh. Claim 15 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Satoh in view of Hogg. The Official action took the position that Satoh teaches the apparatus of applicant's claims, where the disk and stem are shown to be of one piece in figure 1. In response to applicant's previous arguments, the Official action stated that both figure 4A of applicant's specification and figure 1 of Satoh show the rotating disk and stem depicted as a single material. The Official action stated that if one of ordinary skill in the art at the time the invention was made could reasonably recognize that figure 4A of applicant's specification describes a disk and stem as a single piece, then figure 1 of Satoh would also reasonably convey that the disk and stem are of a single piece. The Official action continued that it is well settled that drawings in the prior art can be relied upon to show claimed structure.

² U.S. Patent No. 4,330,803 of Karol

³ U.S. Patent No. 5,497,740 of Thiemeier

⁴ U.S. Patent No. 5,814,573 of Hogg

Applicant respectfully submits that the teachings of Satoh cannot show or suggest to one of ordinary skill in the art a rotating disk and stem having a uniform and integral structure, as presently claimed. While the Official action is attempting to equate figure 4A of applicant's specification with figure 1 of Satoh, figure 4A of applicant's specification is a cross-sectional view whereas figure 1 of Satoh is a schematic view. The cross-sectional view of applicant's figure 4A shows an integral uniform of the disk and stem by the cross-hatching thereon, which is for a refractory material. On the other hand, the schematic view of figure 1 of Satoh has no cross-hatching, and therefore cannot show an integral structure, as would be understood by any person skilled in this art. In other words, figure 1 of Satoh shows no cross-hatching for the disk, stem, chamber, piping, crucible, and other materials therein with the possible exception of molten metal. Therefore, one of ordinary skill in the art cannot read or understand figure 1 of Satoh to show the makeup of the material used for the structures therein, especially for the disk and stem. For this reason, the teachings of Satoh cannot teach that the disk and stem are integrally made, as required in the present claims.

In addition, the remaining discussions in the teachings of Satoh discuss a wide variety of disk materials including coatings, etc., without any discussion of the stem materials. Figures 3(a), 3(b), 3(c), 4(a), 4(b), 4(c), and 4(d) of Satoh show various rotating disks within the teachings of Satoh. If the teachings of Satoh proposed an integrally formed disk and stem, why are the disks in

figures 3(a), 3(b), 3(c), 4(a), 4(b), 4(c), and 4(d) shown without stems? In other words, why would the authors of Satoh removed the stems from the disks integrally formed therewith for the photographs shown in figures 3(a), 3(b), 3(c), 4(a), 4(b), 4(c), and 4(d), when doing so could damage the disk? Removing the stems from the disks could cause damage to the disks, if the stem and disk were integrally formed in the teachings of Satoh. Therefore, applicant respectfully submits that the main reason the stems are not shown in figures 3(a), 3(b), 3(c), 4(a), 4(b), 4(c), and 4(d) is that the disk and stems were never integrally formed within the teachings of Satoh.

For at least all the foregoing reasons, one of ordinary skill in the art would not believe or understand that the rotating disk and stem proposed by Satoh have a uniform and integral structure, as required in the present claims.

Furthermore, the uniform integral disk and stem structure of applicant's claims has many advantages over the rotating disk structure proposed by the teachings of Satoh. These advantages are discussed in applicant's specification disclosure and include the following:

(1) As discussed at the top of page 5 of applicant's specification, when the disk is made of a metal or other material different from that of the stem, a problem arises due to the differences in thermal expansion of the disk relative to the stem. When the disk and stem are made from different materials, the different coefficients of thermal expansion cause strain by thermal stress, thereby shortening the durability or longevity of the disk and stem. In

addition, when iron or titanium is used as the disk material, since this material is highly reactive with the molten metal of the thermoelectric material, the composition of the thermoelectric material is changed and thereby the quality of the thermoelectric material is diminished. In contrast thereto, the presently claimed invention includes a rotating disk having a disk and stem made with a uniform integral structure, such as shown in Fig. 4A of applicant's specification, that can be made with silicon nitride. This structure provides a lightweight device that can withstand thermal shock (thermal stress). In addition, the presently claimed invention does not react with molten metal, and therefore does not contaminate the molten metal.

(2) Attention is respectfully directed to Fig. 5 of the present application, which shows results of various experiments concerning the presently claimed invention and comparative materials. In comparative examples 7-10, a titanium holder (stem) was attached to boron nitride and graphite disks. The structure proposed by Satoh is similar to that in comparative examples 7-10, namely, a stem made of one material (such as a metal) and a disk made of another material. Such structures can have high strength, but are heavy. While the mechanical strength of the rotating disk can be maintained in these comparative examples, the mass and the heat capacity of the rotating disk were also increased and the molten metal tended to solidify on the disk. When the molten metal was solidified, the operation stability was lowered such as occurrence of vibrations and the powder yield was also poor as shown in Fig. 5

for comparative examples 7 to 10. Further, the average particle diameter was only about 70 μm .

(3) The presently claimed invention permits very high-speed rotation of the rotation disk, and it enables the fabrication of small size powders effectively. This is achieved in the present claims by the integral and uniform structure of the disk and stem, which can be made of a light material such as silicon nitride. In Satoh, Fe-base powders (size of about 850 μm) are fabricated at a rotating speed of 18,000 rpm. Comparative examples 7-10 in Fig. 5 of applicant's specification disclosure, which correspond to the teachings of Satoh, show a mean grain size of 62-70 μm . On the other hand, the rotating disk of the presently claimed invention can fabricate micro powders having a size of about 30 μm for thermoelectric modules using a rotating speed of 60,000 rpm.

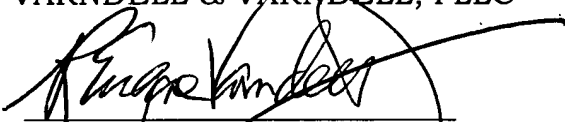
The teachings of Hogg were used in the rejection of claim 15, as suggesting the sialon defined therein. However, these teachings do not cure or rectify the deficiencies in the teachings of Satoh, which were discussed at length above.

For at least the foregoing reasons, applicant respectfully submits that the invention set forth in claims 12-15 is patently distinguishable from the teachings of Satoh alone or combined with those of Hogg within the meaning of 35 U.S.C. § 102 or 35 U.S.C. § 103. Therefore, applicant respectfully requests that the examiner reconsider and withdraw the rejections over these teachings.

A formal allowance of claims 12-15 is respectfully requested. While it is believed that the present response places the application in condition for allowance, should the examiner have any comments or questions, it is respectfully requested that the undersigned be telephoned at the below listed number to resolved any outstanding issues.

In the event this paper is not timely filed, applicant hereby petitions for an appropriate extension of time. The fee therefor, as well as any other fees which may become due, may be charged to our deposit account No. 22-0256.

Respectfully submitted,
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